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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-2831
Plant ID No.:	051-00130
Applicant:	Appalachia Midstream Services, L.L.C. (AMS)
Facility Name:	Miller Compressor Station
Location:	Bannen, Marshall County
SIC Code:	1311
Application Type:	Construction
Received Date:	March 3, 2010
Engineer Assigned:	Jerry Williams II, P.E.
Fee Amount:	$2,000.00
Date Received:	March 3, 2010
Complete Date:	April 29, 2010
Due Date:	July 28, 2010
Applicant Ad Date:	April 1, 2010
Newspaper:	*Moundsville Daily Echo*
UTM's:	Easting: 527.64 km Northing: 4397.98 km Zone: 17
Description:	Construction of a new natural gas compressor station with six (6) natural gas compressor engines, three (3) primary generators, three (3) backup generators, two (2) triethylene glycol (TEG) dehydration units, ten (10) 400-bbl pipeline fluids storage tanks, two (2) pipeline fluids/water storage tanks, a liquids stabilizer including one (1) hot oil heater, one (1) flare, and miscellaneous associated equipment.

DESCRIPTION OF PROCESS

The following process description was taken from Permit Application R13-2831:

The natural gas inlet stream from surrounding area wells enters the facility through an inlet suction separator prior to the gas being compressed. After the inlet gas passes through a compressor, it goes through the dehydration process before exiting the facility. Dehydration units are used to remove water from the gas. In the dehydration process, gas passes through a contactor vessel where water is absorbed by the glycol. The "rich" glycol containing water goes to the glycol reboiler where heat is used to boil off the water. The heat is supplied by a natural

gas-fired reboiler that exhausts to the atmosphere. Overhead still column emissions will be controlled by an air-cooled condenser. The non-condensables from the still column emissions overheads will be routed to the reboiler and burned as fuel with 95% destruction efficiency. Under normal operating circumstances, flash tank overhead vapors will be routed to the reboiler to be burned as fuel. Any excess flash gas vapors not burned as fuel will be routed to the stabilizer feed drum. During upset conditions, excess flash gas may be routed to the flare and combusted. Upset conditions include loss of both permanent and backup power or compressor malfunction of the primary and secondary flash gas compressors. Collected liquids are stabilized to remove volatile components before being stored in tanks and transported off-site by truck. Overhead vapors generated in the stabilizer are compressed by an electric-driven flash gas compressor and recycled to the inlet gas stream. The hot oil heater provides hot oil to the stabilizer. Condensate dropout from liquids dumps, produced water and other pipeline fluids are stored in storage tanks and transported off-site via truck. A Joule-Thompson (JT) system with a capacity of less than 10 mmscfd will be used to lower the heat content of the fuel gas. The generators provide electric power to the flash gas compressor, glycol pumps, hot oil pumps and other electrical equipment. The flare is used to combust gas during upsets and may also be used to combust flash tank off-gas and condensate stabilizer overhead gas as needed during flash gas compressor shutdown or maintenance. Emissions from fugitive components also occur.

SITE INSPECTION

A site inspection was conducted in April 2010 by Steven Sobutka of the DAQ NPRO. The facility had not been constructed at that time. The inspector did not see any problems with the proposed site.

Directions as given in the permit application are as follows:

From Bannen, head southwest on Amos Hollow Road/County Road 89 toward Clark Hill for 1.1 miles. Turn left at Laurel Run. In 0.8 miles, turn right to stay on Laurel Run. In 0.4 miles, take slight left at Johnson Hill. Take the first left onto County Road 1/22/Johnson Ridge.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Maximum controlled point source emissions from AMS's Miller Compressor Station are summarized in the table below.

Emission Point ID	Emission Unit ID	Process Unit	Pollutant	Maximum Controlled Emission Rate	
				Hourly (lb/hr)	Annual (ton/year)
EPCE-1	EUCE-1	1,380 hp Waukesha L5794 GSI Compressor Engine	Nitrogen Oxides	1.48	6.48
			Carbon Monoxide	1.81	7.92
			Sulfur Dioxide	0.03	0.13
			Particulate Matter-10	0.10	0.43
			Volatile Organic Compounds	0.91	4.00
			Formaldehyde	0.08	0.34
EPCE-2	EUCE-2	1,380 hp Waukesha L5794 GSI Compressor Engine	Nitrogen Oxides	1.48	6.48
			Carbon Monoxide	1.81	7.92
			Sulfur Dioxide	0.03	0.13
			Particulate Matter-10	0.10	0.43
			Volatile Organic Compounds	0.91	4.00
			Formaldehyde	0.08	0.34
EPCE-3	EUCE-3	1,380 hp Waukesha L5794 GSI Compressor Engine	Nitrogen Oxides	1.48	6.48
			Carbon Monoxide	1.81	7.92
			Sulfur Dioxide	0.03	0.13
			Particulate Matter-10	0.10	0.43
			Volatile Organic Compounds	0.91	4.00
			Formaldehyde	0.08	0.34
EPCE-4	EUCE-4	1,380 hp Waukesha L5794 GSI Compressor	Nitrogen Oxides	1.48	6.48
			Carbon Monoxide	1.81	7.92
			Sulfur Dioxide	0.03	0.13
			Particulate Matter-10	0.10	0.43
			Volatile Organic Compounds	0.91	4.00

		Engine	Formaldehyde	0.08	0.34
EPCE-5	EUCE-5	1,380 hp Waukesha L5794 GSI Compressor Engine	Nitrogen Oxides	1.48	6.48
			Carbon Monoxide	1.81	7.92
			Sulfur Dioxide	0.03	0.13
			Particulate Matter-10	0.10	0.43
			Volatile Organic Compounds	0.91	4.00
			Formaldehyde	0.08	0.34
EPCE-6	EUCE-6	1,380 hp Waukesha L5794 GSI Compressor Engine	Nitrogen Oxides	1.48	6.48
			Carbon Monoxide	1.81	7.92
			Sulfur Dioxide	0.03	0.13
			Particulate Matter-10	0.10	0.43
			Volatile Organic Compounds	0.91	4.00
			Formaldehyde	0.08	0.34
EPGEN-1	EUGEN-1	1,065 hp Primary Waukesha P48GSI Compressor Engine	Nitrogen Oxides	1.39	6.05
			Carbon Monoxide	1.22	5.34
			Sulfur Dioxide	0.02	0.09
			Particulate Matter-10	0.07	0.31
			Volatile Organic Compounds	0.10	0.44
			Formaldehyde	0.01	0.03
EPGEN-1.2	EUGEN-1.2	1,065 hp Backup Waukesha P48GSI Compressor Engine	Nitrogen Oxides	1.39	0.35
			Carbon Monoxide	1.22	0.31
			Sulfur Dioxide	0.02	0.01
			Particulate Matter-10	0.07	0.02
			Volatile Organic Compounds	0.10	0.03
			Formaldehyde	0.01	0.01
EPGEN-2	EUGEN-2	805 hp Primary Capstone C600	Nitrogen Oxides	0.25	1.10
			Carbon Monoxide	0.56	2.45
			Sulfur Dioxide	0.02	0.09
			Particulate Matter-10	0.01	0.06

		Compressor Engine	Volatile Organic Compounds	0.01	0.04
			Formaldehyde	0.01	0.02
EPGEN-2.2	EUGEN-2.2	805 hp Backup Capstone C600 Compressor Engine	Nitrogen Oxides	0.25	0.06
			Carbon Monoxide	0.56	0.14
			Sulfur Dioxide	0.02	0.01
			Particulate Matter-10	0.01	0.01
			Volatile Organic Compounds	0.01	0.01
			Formaldehyde	0.01	0.01
EPGEN-3	EUGEN-3	930 hp Primary Caterpillar G399 TA HCR Compressor Engine	Nitrogen Oxides	1.07	4.69
			Carbon Monoxide	1.33	5.83
			Sulfur Dioxide	0.02	0.09
			Particulate Matter-10	0.07	0.30
			Volatile Organic Compounds	0.21	0.92
			Formaldehyde	0.21	0.90
EPGEN-3.2	EUGEN-3.2	930 hp Primary Caterpillar G399 TA HCR Compressor Engine	Nitrogen Oxides	1.07	0.27
			Carbon Monoxide	1.33	0.33
			Sulfur Dioxide	0.02	0.01
			Particulate Matter-10	0.07	0.02
			Volatile Organic Compounds	0.21	0.05
			Formaldehyde	0.21	0.05
EPSTL-1	EUDHY-1	53.8 MMscfd Glycol Dehydrator Still Column	Volatile Organic Compounds	0.40	1.75
			Benzene	0.15	0.16
			Ethylbenzene	0.01	0.01
			Toluene	0.10	0.22
			Xylenes	0.01	0.01
			n-Hexane	0.02	0.04
		1.00 mmBTU/hr Glycol	Nitrogen Oxides	0.10	0.44
			Carbon Monoxide	0.08	0.35
			Sulfur Dioxide	0.01	0.01

EPRBL-1	EUDHY-1	Dehydrator Reboiler	Particulate Matter-10	0.01	0.04
			Volatile Organic Compounds	0.01	0.04
EPSTL-2	EUDHY-2	53.8 MMscfd Glycol Dehydrator Still Column	Volatile Organic Compounds	0.40	1.75
			Benzene	0.15	0.16
			Ethylbenzene	0.01	0.01
			Toluene	0.10	0.22
			Xylenes	0.01	0.01
			n-Hexane	0.02	0.04
EPRBL-2	EUDHY-2	1.00 mmBTU/hr Glycol Dehydrator Reboiler	Nitrogen Oxides	0.10	0.44
			Carbon Monoxide	0.08	0.35
			Sulfur Dioxide	0.01	0.01
			Particulate Matter-10	0.01	0.04
			Volatile Organic Compounds	0.01	0.04
EPTK-1 -- EPTK-12	EUTK-1 -- EUTK-12	Twelve (12) 400 bbl Storage Tanks	Volatile Organic Compounds	11.23	49.18
EPOH-1	EUOH-1	3.35 mmBTU/hr Hot Oil Heater	Nitrogen Oxides	0.34	1.49
			Carbon Monoxide	0.28	1.23
			Sulfur Dioxide	0.01	0.01
			Particulate Matter-10	0.02	0.09
			Volatile Organic Compounds	0.02	0.09
APCFLARE	APCFLARE	Flare	Nitrogen Oxides	4.45	0.59
			Carbon Monoxide	24.23	3.19
			Sulfur Dioxide	0.01	0.01
			Particulate Matter-10	0.01	0.01
			Volatile Organic Compounds	21.72	2.85
NA	NA	Fugitive Emissions	Volatile Organic Compounds	3.51	15.39

REGULATORY APPLICABILITY

Unless otherwise stated WVDEP DAQ did not determine whether the permittee is subject to an area source air toxics standard requiring Generally Achievable Control Technology (GACT) promulgated after January 1, 2007 pursuant to 40 CFR 63, including the area source air toxics provisions of 40 CFR 63, Subpart HH and 40 CFR 63, Subpart ZZZZ.

The following rules apply to the facility:

45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers)

AMS would be subject to the opacity requirements in 45CSR2, which is 10% opacity based on a sixe minute block average.

45CSR4 (To Prevent and Control the Discharge of Air Pollutants into the Open Air which Causes or Contributes to an Objectionable Odor or Odors)

45CSR4 states that an objectionable odor is an odor that is deemed objectionable when in the opinion of a duly authorized representative of the Air Pollution Control Commission (Division of Air Quality), based upon their investigations and complaints, such odor is objectionable. No odors have been deemed objectionable.

45CSR6 (To Prevent and Control the Discharge of Air Pollution from Combustion of Refuse)

The permittee has proposed to install an emergency and maintenance flare (FLARE3). This rule defines incineration as the destruction of combustible refuse by burning in a furnace designed for that purpose. The purpose of this flare is to destroy VOC emissions through incineration. Therefore, it meets this definition.

According to 45CSR6, Section 4.1, this flare must meet the particulate matter limit by weight. The flare's proposed emission rate is less than the allowable under Section 4.1. Therefore, DTI will meet this rule.

The flare is also subject to the 20% opacity limitation in section 4.3 of this rule. Typically, the incineration of most gases produce minimal visible emissions.

45CSR13 (Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation)

45CSR13 applies to this source due to the fact that AMS exceeds the regulatory emission threshold for criteria pollutants of 6 lb/hr and 10 ton/year, and AMS is subject to a substantive requirement of an emission control promulgated by the Secretary.

45CSR16 (Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60)

45CSR16 applies to this source by reference of, 40CFR60, Subpart KKK, 40CFR60 and 40CFR60, Subpart JJJJ. AMS is subject to the recordkeeping, monitoring, and testing required by 40CFR60, Subpart KKK and 40CFR60, Subpart JJJJ.

45CSR30 (Requirements for Operating Permits)

This permit does not affect 45CSR30 applicability. The source is a nonmajor source subject to 45CSR30.

40CFR60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines)

AMS's compressor engines are subject to 40CFR60 Subpart JJJJ, which sets forth emission limits, fuel requirements, installation requirements, and monitoring requirements based on the year of installation of the subject internal combustion engine. 40CFR60 Subpart JJJJ is applicable to owners and operators of new stationary spark ignition internal combustion engines manufactured after July 1, 2007, for engines with a maximum rated power capacity greater than 500 hp.

The six (6) new proposed 1,380 hp engines (EPCE-1 – EPCE-6) will be subject to this rule. The emission limits for these engines are the following: NOx – 2.0 g/hp-hr (6.08 lb/hr); CO – 4.0 g/hp-hr (12.16 lb/hr); and VOC – 1.0 g/hp-hr (3.04 lb/hr). Based on the manufacturer's specifications for these engines, the emission standards will be met.

The two (2) proposed 1,065 hp engines (EPGEN-1, EPGEN-1.2) will be subject to this rule. The emission limits for these engines are the following: NOx – 2.0 g/hp-hr (4.69 lb/hr); CO – 4.0 g/hp-hr (9.39 lb/hr); and VOC – 1.0 g/hp-hr (2.35 lb/hr). Based on the manufacturer's specifications for these engines, the emission standards will be met.

The two (2) proposed 805 hp engines (EPGEN-2, EPGEN-2.2) will be subject to this rule. The emission limits for these engines are the following: NOx – 2.0 g/hp-hr (3.55 lb/hr); CO – 4.0 g/hp-hr (7.09 lb/hr); and VOC – 1.0 g/hp-hr (1.77 lb/hr). Based on the manufacturer's specifications for these engines, the emission standards will be met.

The two (2) proposed 930 hp engines (EPGEN-3, EPGEN-3.2) will be subject to this rule. The emission limits for these engines are the following: NOx – 2.0 g/hp-hr (4.10 lb/hr); CO – 4.0 g/hp-hr (8.20 lb/hr); and VOC – 1.0 g/hp-hr (2.05 lb/hr). Based on the manufacturer's specifications for these engines, the emission standards will be met.

Because these engines will not be certified by the manufacturer, AMS will be required to perform an initial performance test within 180 days from startup, and subsequent testing every 8,760 hours or 3 years, whichever comes first.

40CFR60 Subpart KKK (Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants)

40CFR60 Subpart KKK applies to onshore natural gas processing plants that commenced construction after January 20, 1984. The facility is subject to this rule due to the JT Plant. AMS must meet the LDAR requirements of Subpart KKK, which includes the provisions referenced in 40CFR60 Subpart VV.

The following rules do not apply to the facility:

40CFR60 Subpart Kb (Standards of Performance for VOC Liquid Storage Vessels)

40CFR60 Subpart Kb does not apply to storage vessels with a capacity less than 75 cubic meters. The tanks that AMS has proposed to install are 63.84 cubic meters each. Therefore, they would not be subject to this rule.

40CFR63 Subpart ZZZZ (National Emission Standards for Reciprocating Ignition Internal Combustion Engines)

40CFR63 Subpart HH (National Emission Standards for Hazardous Air Pollutants: Oil and Natural Gas Production and National Emission Standards for Hazardous Air Pollutants: Natural Gas Transmission and Storage)

40CFR63 Subpart HHH (National Emission Standards for Hazardous Air Pollutants: Natural Gas Transmission and Storage)

WVDEP DAQ did not determine whether the permittee is subject to an area source air toxics standard requiring Generally Achievable Control Technology (GACT) promulgated after January 1, 2007 pursuant to 40 CFR 63, including the area source air toxics provisions of 40 CFR 63, Subpart HH and 40 CFR 63, Subpart ZZZZ.

These promulgated national emission standards for hazardous air pollutants (NESHAP) limit emissions of hazardous air pollutants (HAP) from oil and natural gas production and natural gas transmission and storage facilities. These final rules implement section 112 of the Clean Air Act (Act) and are based on the Administrator's determination that oil and natural gas production and natural gas transmission and storage facilities emit HAP identified on the EPA's list of 188 HAPs.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

There will be small amounts of various non-criteria regulated pollutants emitted from the combustion of natural gas. However, due to the concentrations emitted, detailed toxicological information is not included in this evaluation.

The following information was obtained from USEPA's Air Toxic Website.

Benzene
Benzene is found in the air from emissions from burning coal and oil, gasoline service stations, and motor vehicle exhaust. Acute (short-term) inhalation exposure of humans to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and, at high levels, unconsciousness. Chronic (long-term) inhalation exposure has caused various disorders in the blood, including reduced numbers of red blood cells and aplastic anemia, in occupational settings. Reproductive effects have been reported for women exposed by inhalation to high levels, and adverse effects on the developing fetus have been observed in animal tests. Increased incidence of leukemia (cancer of the tissues that form white blood cells) have been observed in humans occupationally exposed to benzene. EPA has classified benzene as a Group A, human carcinogen.

Formaldehyde
Formaldehyde is used mainly to produce resins used in particleboard products and as an intermediate in the synthesis of other chemicals. Exposure to formaldehyde may occur by breathing contaminated indoor air, tobacco smoke, or ambient urban air. Acute (short-term) and chronic (long-term) inhalation exposure to formaldehyde in humans can result in respiratory symptoms, and eye, nose, and throat irritation. Limited human studies have reported an association between formaldehyde exposure and lung and nasopharyngeal cancer. Animal inhalation studies have reported an increased incidence of nasal squamous cell cancer. EPA considers formaldehyde a probable human carcinogen (Group B1).

Acrolein
Acrolein is primarily used as an intermediate in the synthesis of acrylic acid and as a biocide. It may be formed from the breakdown of certain pollutants in outdoor air or from the burning of organic matter including tobacco, or fuels such as gasoline or oil. It is toxic to humans following inhalation, oral or dermal exposures. Acute (short-term) inhalation exposure may result in upper respiratory tract irritation and congestion. No information is available on its reproductive, developmental, or carcinogenic effects in humans, and the existing animal cancer data are considered inadequate to make a determination that acrolein is carcinogenic to humans.

Acetaldehyde
Acetaldehyde is mainly used as an intermediate in the synthesis of other chemicals. It is ubiquitous in the environment and may be formed in the body from the breakdown of ethanol. Acute (short-term) exposure to acetaldehyde results in effects including irritation of the eyes, skin, and respiratory tract. Symptoms of chronic (long-term) intoxication of acetaldehyde resemble those of alcoholism. Acetaldehyde is considered a probable human carcinogen (Group B2) based on inadequate human cancer studies and animal studies that have shown nasal tumors in rats and laryngeal tumors in hamsters.

Hexane
Hexane is used to extract edible oils from seeds and vegetables, as a special-use solvent, and as a cleaning agent. Acute (short-term) inhalation exposure of humans to high levels of hexane causes mild central nervous system (CNS) effects, including dizziness, giddiness, slight nausea, and headache. Chronic (long-term) exposure to hexane in air is associated with polyneuropathy in humans, with numbness in the extremities, muscular weakness, blurred vision, headache, and fatigue observed. Neurotoxic effects have also been exhibited in rats. No information is available on the carcinogenic effects of hexane in humans or animals. EPA has classified hexane as a Group D, not classifiable as to human carcinogenicity.

Ethylbenzene
Ethylbenzene is mainly used in the manufacture of styrene. Acute (short-term) exposure to ethylbenzene in humans results in respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects such as dizziness. Chronic (long-term) exposure to ethylbenzene by inhalation in humans has shown conflicting results regarding its effects on the blood. Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethylbenzene. Limited information is available on the carcinogenic effects of ethylbenzene in humans. In a study by the National Toxicology Program (NTP), exposure to ethylbenzene by inhalation resulted in an increased incidence of kidney and testicular tumors in rats, and lung and liver tumors in mice. EPA has classified ethylbenzene as a Group D, not classifiable as to human carcinogenicity.

Toluene
Toluene is added to gasoline, used to produce benzene, and used as a solvent. Exposed to toluene may occur from breathing ambient or indoor air. The central nervous system (CNS) is the primary target organ for toluene toxicity in both humans and animals for acute (short-term) and chronic (long-term) exposures. CNS dysfunction and narcosis have been frequently observed in humans acutely exposed to toluene by inhalation; symptoms include fatigue, sleepiness, headaches, and nausea. CNS depression has been reported to occur in chronic abusers exposed to high levels of toluene. Chronic inhalation exposure of humans to toluene also causes irritation of the upper respiratory tract and eyes, sore throat, dizziness, and headache. Human studies have reported developmental effects, such as CNS dysfunction, attention deficits, and minor craniofacial and limb anomalies, in the children of pregnant women exposed to toluene or mixed solvents by inhalation. Reproductive effects, including an association between exposure to toluene and an increased incidence of spontaneous abortions, have also been noted. However, these studies are not conclusive due to many confounding variables. EPA has classified toluene as a Group D, not classifiable as to human carcinogenicity.

Methanol
Methanol is released to the environment during industrial uses and naturally from volcanic gases, vegetation, and microbes. Exposure may occur from ambient air and during the use of solvents. Acute (short-term) or chronic (long-term) exposure of humans to methanol by inhalation or ingestion may result in blurred vision, headache, dizziness, and nausea. No information is available on the reproductive, developmental, or carcinogenic effects of methanol in humans. Birth defects have been observed in the offspring of rats and mice exposed to methanol by inhalation. EPA has not classified methanol with respect to carcinogenicity.

AIR QUALITY IMPACT ANALYSIS

The facility will not be a major source of HAP's as defined by 45CSR14. Based on the nature of the emissions and the annual emission rate, no air quality impact analysis was performed.

MONITORING OF OPERATIONS

AMS will be required to perform the following monitoring:

1. Monitor and record quantity of natural gas consumed for all engines, and combustion sources.
2. Monitor all applicable requirements of 40CFR60 Subparts JJJJ and KKK.

AMS will be required to perform the following recordkeeping:

1. Maintain records of the amount of natural gas consumed in each combustion source.
2. Maintain records of testing conducted in accordance with the permit. Said records shall be maintained on-site or in a readily accessible off-site location
3. Maintain the corresponding records specified by the on-going monitoring requirements of and testing requirements of the permit.
4. Maintain records of the visible emission opacity tests conducted per the permit.
5. Maintain a record of all potential to emit (PTE) HAP calculations for the entire facility. These records shall include the natural gas compressor engines and ancillary equipment.
6. The records shall be maintained on site or in a readily available off-site location maintained by AMS for a period of five (5) years.
7. Maintain records of all applicable requirements of 40CFR60 Subparts JJJJ and KKK.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates AMS's Miller Compressor Station meets all the requirements of applicable regulations. Therefore, impact on the surrounding area should be minimized and it is recommended that the Marshall County location should be granted a 45CSR13 construction permit for their facility.

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Jerry Williams II, P.E.
Engineer

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Date